
VHF/UHF – An Expanding World

David Smith VK3HZ

Weak Signal

David Smith - VK3HZ

More reports of possible losses of our spectrum have surfaced during the month.

3.5 GHz Band

Further to my report two months ago regarding a review of the 3.5 GHz band, the Minister for Communications has issued a draft Direction to the ACMA to enable licensing in the 3.5 GHz band for use in the National Broadband Network (NBN) around the major mainland cities.

A 25 MHz block at 3400-3425 MHz and a 50 MHz block at 3492.5-3542.5 MHz, are specified in the draft Direction document. Amateur weak signal operation is currently located in a 2 MHz block starting at 3400 MHz and so will be directly affected.

The draft Direction requires the ACMA to take all necessary steps by 30 April 2015 to be in a position to issue apparatus licences after that date, for the purposes of the NBN.

The Department of Communications is seeking public comment on the Minister's draft Direction and an accompanying Explanatory Statement via its website. All interested parties, including all amateurs with equipment either operational or under construction, are urged to lodge comments.

1.2 GHz Band

According to a report on AMSAT UK:

<http://amsat-uk.org/2014/08/13/23-cm-band-and-wrc-2018/>

a paper to be discussed at the IARU Region 1 Conference in Varna-Albena, Bulgaria, September 21-27, 2014 highlights the threat to continued amateur radio usage of our 23 cm allocation which is now being used by the Galileo GPS system.

Up until now there have only been four Galileo test satellites in orbit which have been used to validate the system. The first two satellites of the operational Galileo GPS constellation were launched on August 22, 2014 and will be followed by further launches over the next 3 years.

During the initial test phase, two German ATV repeaters were shutdown due to interference to a user's Galileo receiver. There are also rumours that all 23 cm repeaters in Austria were shutdown.

This is yet another threat that we need to keep a close eye on.

Lyle Patison VK2ALU (SK) VK EME Pioneer

Roger VK2ZRH has submitted this article about the achievements of Lyle VK2ALU:

The Australian V-U-SHF community, and the global EME tribe, lost an outstanding leader on 17 July 2014. Lyle put Australia "on the map" on 432 MHz EME from 1972, when moonbounce contacts into the southern hemisphere – on any band – were rare indeed.

Over the decades from the late 1960s through to the 21st century, Lyle patiently pursued his strong interest in V-U-SHF terrestrial DX and the "ultimate" DX – moonbounce – over the last three decades of the 20th century, establishing a

number of significant records along the way on 432 MHz, 1296 MHz and 10 GHz.

To achieve success with projects large or small, Lyle had a personal philosophy for success, which he dubbed “PEP” – planning, effort and persistence. His philosophy certainly paid off.

I recall first meeting Lyle when I returned to live in Sydney in 1971 and joined the NSW VHF & TV Group. Lyle lived south of Sydney, near Wollongong, and was a member of the Illawarra Amateur Radio Society. On learning that the University of Wollongong had taken over responsibility of a 10 metre diameter dish facility from the CSIRO at nearby Dapto, Lyle spawned a plan to return it to productive use for moonbounce experiments.

Through the auspices of the Illawarra ARS, Lyle convinced the University to permit access. He gathered a team of local enthusiasts to assist acquiring, installing and commissioning the required equipment for the station, which used the IARS callsign VK2AMW from the early 1970s through the mid-1980s. In the early 70s, Lyle presented a number of lectures to the NSW VHF & TV Group on the moonbounce project and contributed reports to the VHF-UHF newsletter I produced at the time – 6UP. Lyle was a subscriber.

Led by Lyle, the VK2AMW group received their own echoes for the first time on 31 March 1972, at around 1130 UT, recorded clearly on a chart recorder, seen in Figure 1 (from 6UP for May 1972, p.6).

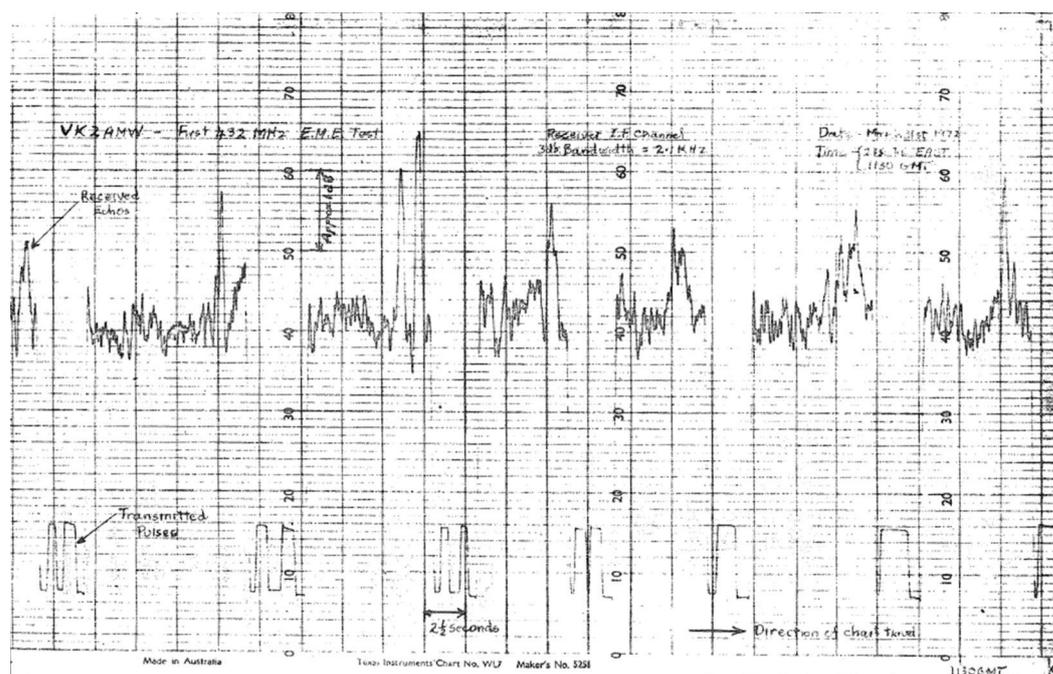


Figure 1. Chart recording of VK2AMW’s first echoes from the moon, 31 March 1972 at 1130 UT, taken by Lyle Patison VK2ALU (6UP, May 1972).

From that first success, VK2AMW went on to work WA6HXW, to set a new EME DX record for the era. Here’s how that went, in Lyle’s own words: Moonbounce tests were then arranged with WA6HXW in California USA and on the second test on 19/4/72 signals were heard both ways, resulting in the ARRL recognizing WA6HXW and VK2AMW as the new holders of the 432 MHz Moonbounce distance record.

The group had a high power permit, the transmitter using a pair of 4CX250s in the

final, putting out 400 W carrier. The EME system was assembled from a combination of commercial equipment, adapted ex-commercial and homebrew gear. A Drake 2B was the station receiver, fed by a 432-28 MHz solid-state converter made by STC. The front end preamp used a BFR91 with a noise figure of 3 dB. This was upgraded in late 1972 with a Fairchild MT4578 (from K6MYC), yielding a NF of 1.2 dB.

Over 1972, VK2AMW with Lyle at the helm conducted 18 EME “tests” with WA6HXW, OZ7UNI, K2UYH and W6FZJ. It was tough going, however, as signal reports were only exchanged on six occasions. Two skeds with OZ7UNI were unsuccessful, only two out of six succeeded with WA6HXW, three out of five with W6FZJ and only one out of five with K2UYH. Persistence paid off.

This was an encouraging start and cemented VK2AMW as a key station in the global EME tribe of the era. It was a team effort, inspired by Lyle, with local amateurs Hank VK2BHL, Charlie VK2ZEW and Roger VK2BRE on the team.

The signal from VK2AMW gained accolades following an escapade in January 1973 by amateurs at the US Naval Research Laboratory in Washington DC, who used a 150-foot (45.7 m) dish to listen for other amateurs’ EME signals on 2 m, 70 cm and 23 cm. The listening test was widely publicised around the world. Here are Lyle’s own words, again: VK2AMW gained the distinction of being the best signal heard south of the equator on any of the bands (144 MHz, 432 MHz and 1215 MHz) used by NRL for the tests.

On 30 March 1974, VK2AMW made their first European contact, working Peter G3LTF, to establish a new world DX record for 432 MHz EME of 16,955 km, which wasn’t bettered for many years. Contacts were predominantly made by hand-sent Morse, received by ear. However, at Lyle VK2ALU’s behest, VK2AMW also chased QSOs on RTTY, first working Al Katz K2UYH and, later, others. You might say these QSOs opened the “digital era” for EME.

Almost 11 years after that 70 cm EME contact with G3LTF, having moved to 1296MHz in the mid-1980s, VK2AMW worked Peter again on 2 March 1985.

Sadly, episodes of vandalism at the Dapto dish site forced the closure of the VK2AMW EME station and Lyle embarked on building gear for 10 GHz, in time setting a VK1-VK2 terrestrial DX record with portable gear in company with Bill VK2ZAC – VK2ALU/1 worked VK2ZAC/2 on 2 January 1995, for 218.4 km. But, the call of the Moon was strong and Lyle assembled a 10 GHz home station based on a 3.8 m solid dish, which he mounted on a trailer that he towed up his driveway to position it for EME – no local council permits required! From the footpath outside his home, it was an impressive sight, indeed. With ingenuity typical of Lyle, for the dish feed, he fashioned a rectangular to elliptical section waveguide transition in his home workshop.

Characteristically, Lyle set two world DX records on 10 GHz; first, in 1994, to WA7CJO for 12,601.3 km on 9 October 1994, followed by a contact with G3WDG for 17,000.4 km, on 18 August 1996.

I understand that Lyle’s interest in amateur radio was sparked from his experiences in flying with the RAF Bomber Command in WW2; having survived the very high casualties of that unit. He subsequently gained his amateur licence in the late-1940s. For all his towering achievements, Lyle was a humble man, never boastful, willing to share his knowledge and provide advice when asked. He gave many well-prepared presentations on the practicalities of EME, which always created great interest. In projects large or small, Lyle was patient, painstaking and thorough, from the planning right through to implementation. The ‘20 contacts in 10 minutes’ of 20 m DX was not for him; 20 contacts in a year was a busy year!

He never stood still with his amateur radio exploits; there was always some improvement that he saw could be made, some new experiment or test to perform, some new ground to break. When he encountered some aspect where he knew his knowledge was lacking, Lyle set out to learn about it. One time, I recall, as he was working on his 10 GHz EME system, Lyle telephoned me, asking if I knew of a reference work on solar noise. He remembered a conversation we'd had in the 1970s, when I worked at IPS Radio & Space Services and had refurbished a multi-band microwave solar radiometer, and thought (correctly, as it turned out) that I might be able to help.

The Australian radio amateur community and the international EME tribe have lost a remarkable individual.

I would like to thank Ross VK2VVV and Hank ex-VK2BHL for assistance in assembling the foregoing. The annals of 6UP, 1972-1974, provided some reference material, along with the WIA Australian VHF-UHF Records Since 1947.

Please send any Weak Signal reports to David VK3HZ

Digital DX Modes

Rex Moncur – VK7MO

Extreme Grids 10 GHz Terrestrial

Last month Rex, VK7MO reported on the approach taken with Dave VK3HZ to planning extreme grids on 10 GHz using aircraft scatter and the ISCAT-B WSJT mode. QSOs have been completed (and one failure as noted) with Dave, using this mode and aircraft scatter as follows:

QF49 40 km East of Coonamble (775 km)

QF39 100 km North East of Cobar (703 km)

QG20 45 km North West of Bourke (818 km)

QG21 Queensland to VK3 (905.2 km)

QF09 100 km North of Broken Hill (753 km)

PF98 100 km North of Yunta SA (793 km)

PF83 Kangaroo Island (645 km)

PF88 Lowly Point 20 km East of Whyalla (785 km) unsuccessful

Of note is the longest contact to date - 905.2 km into QG21. This is understood to be the first VK3 to VK4 terrestrial contact on 10 GHz. This was only achieved by careful planning, finding a high location at the VK3 end on the northern side of the Great Dividing Range with the land falling away providing visibility to aircraft flying at 40,000' in the VK4 direction at a range of 480 km.

It is noted that generally these extreme distances are only achieved when there is good weather and we suspect an improvement in the radio refractive index. It is noted that the failure at PF88 coincided with poor weather but could also be attributed to the fact that at the crossing point the aircraft are generally ascending from or descending to Adelaide and are perhaps not high enough. This grid requires a concerted effort at a time when weather conditions are conducive to improved radio refractive index and a focus on Perth flights.

A summary and more detailed reports can be found at:

24 GHz EME DXpedition using JT4f

Following GippsTech, Rex VK7MO took the opportunity to test out his dual PA portable 24 GHz station, which uses a 1.2 metre Mitec dish (1.14 metre effective if you exclude the rim). Up to now Rex has used a single DB6NT 10 Watt PA and could only work EME under very good conditions (i.e. low degradation, spreading and water vapour at both ends and a long common window to allow averaging on JT4f). In order to achieve a viable portable EME operation (i.e. QSO's under average conditions) two 10 watt PA's have been phased up to give around 20 watts. This involves the use of waveguide Magic Tees as reported by Charlie Suckling in DUBUS 2/2014 - an article based on Charlie's work in tuning up Rex's Magic Tees. The extra 3 dB has proved to make a major difference and so far Rex has been able to activate some 22 grid locators on this trip with W5LUA, OK1KIR or G3WDG as shown in Fig 1. At only three locators, marked in Yellow a QSO was not achieved. The reasons were: Richmond - cloud and rain for OK1KIR; Charleville - OK1KIR accidentally clicking the TX first button and thus being in the wrong period; and Bourke - a fractured connection in the DIN plug that provides TX audio to VK7MO's IC-910H.



Fig 1: Grid locators activated on 24 GHz EME. Successful QSOs with one or more stations marked in Red and failures marked in Yellow.

During this trip, data on what was received on all QSOs has been recorded and compared with data on degradation, spreading and water vapour loss to produce a parameter which we call Total Extra Loss referenced to perfect conditions. This data is plotted at Fig 2.

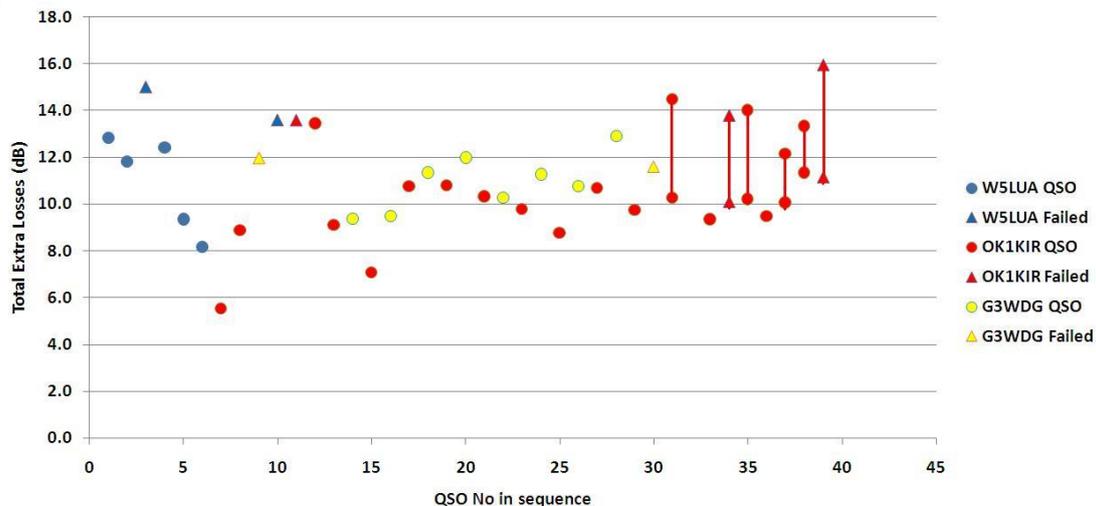


Fig 2: Total Extra Losses due to degradation, spreading and water vapour. Note that the red bars represent the range over which the loss due to cloud is a factor – more work is required to define the effects of cloud within this range

The data is referenced to W5LUA's 2.4 metre dish and a correction has been applied for the additional gain of OK1KIR and G3WDG's larger dishes. Two of the G3WDG failures #9 and #31 relate to PA failure. The OK1KIR failure #11 and # 39 can also be put down to equipment/operational issues. These aside, it can be seen that QSO's are possible with up to around 13 dB Total Extra Loss. To get some idea of what that means, one of the more marginal QSOs to date, #12 had a Total Extra Loss of 13.5 dB made up as follows:

7.3 dB due to water vapour (Precipitable Water [PW] of 35 mm at OK1KIR and 10 mm at VK7MO Cobar)

6.7 dB as a result of 290 Hz full spreading due to libration. (Referenced to 1 Hz spreading but taking account of the fact that OK1KIRs antenna beam-width is smaller than the moon and does not see full spreading.)

2.0 dB degradation as a result of moon distance being greater than the minimum

2.5 dB offset for the additional gain of OK1KIRs antenna cf W5LUA's

The success of this trip turned out to be much better than expected – in part due to the dual PA at VK7MO, which brought his power level up to those of other stations, but also due to the fact that the locations in Central Australia were very dry (PW in the range 7 to 12 mm) and compensated for wide spreading. Similar success could not be expected near the coast where PW is normally much higher.

Special thanks: One of VK7MO's dual 24 GHz PA's failed early in the trip and this was kindly replaced with Doug VK4OE's PA who also provided the test and measurement equipment to ensure the PAs were correctly balanced. 10 GHz EME QSOs were also routinely conducted on this trip but VK7MO's 10 GHz PA also failed and was repaired with the expertise of David VK5KK.

Detailed reports have been prepared on all QSOs and conditions and an overview that will reference each individual report will be produced at the end of the trip which will be available at: <http://www.vk3hz.net/microwave/VK7MO-24G.htm>

Please send any Digital DX Modes reports to Rex VK7MO

Meteor Scatter

Dr Kevin Johnston – VK4UH

The month of August proved to be a very active period on the meteor scatter diary for the year. The Southern Delta Aquarid Meteor Shower, a class-one major event which was expected to peak on the 28-29th July, was well in evidence as I was preparing last month's report. Although this shower is known to have a very broad peak this was exceptional this year. A review of the VK Logger postings suggest that enhanced shower propagation continued for at least 10 days beyond the expected peak, perhaps even longer.

Another major even last month was the one-man VHF DXpedition undertaken in August by Wayne VK5APN. Planning a route through outback VK5 and VK8 and focussing on 2m EME and MS operation, Wayne activated 10 gridsquares - many of them extremely rare and remote. The activity also providing the first VK8 contact for many stations on 2m MS. Irreparable antenna failure towards the end of the trip prevented his activating a further two planned gridsquares. This was a truly outstanding achievement for a single operator.

Wayne VK5APN has provided the following report of his activity:-

"Realising that the conditions for August were brilliant and the best for the year, I decided to activate VK8, one part of VK that is lacking in VHF/UHF activity. Seeing the distances involved and all the un-worked and rare grid squares in Outback VK5, I decided to activate alternate grid squares on the way to the Territory and the ones I did not activate on the way, I would activate on the way back. That way the distances travelled each day was only a couple of 100 km, stopping in the public road side parking areas (thanks to WIKI CAMPS app) and sleeping in the car.

Hence the plan was to activate PF89, PF78, PG70, PG72 and PG63 from the 8th to the 12th August, then to cross the border into VK8 and activate PG64 and PG65 from the 13th to the 18th and then head home activating PG62, PG71, PF79, PF88 and PF97 from 19th to the 23rd. My intention to activate VK8 on Meteor scatter was posted on the VK-Logger forum. Some of the above grids are extremely rare (PF78 and PG72 as an example) as they have only 6 or 7 sub squares that the main road (Stuart Highway) traverses through. Also being in the Woomera Protection area, you are not allowed to deviate from the main road, without prior permission.

The first grid was PF89 which was a short journey off the main route, but being so close to the Stuart Highway (50 km) I decided to activate this. This is just north of the Woomera Township. VK7MO apparently had activated this grid sometime previously. After the activity and in the process of packing up, I was visited by the Defence force guards, wanting to know what I was doing and if I knew about the Woomera Protection Area. I explained to them what I was doing and the map of grid squares. They assumed it was HF comms that I was doing. I informed them that it was VHF. They could not see how that would work until I explained about Meteor Scatter propagation - they were intrigued. They took my details and said they would inform the other guards and that I should not have a problem in the future, which indeed I didn't.

Overall the trip was a success. Providing VK8 for the first time to many stations. One station had been trying for 49 years, 26 weeks and 3 days - longer than I have been alive.

For the complete trip I managed to work 14 initials. From VK8 I worked 7 initials from the 2 grids (PG64 and PG65). One of the highlights of the trip was whilst in PG65 I had a car pull up and a gentleman hop out. Before he could introduce himself, I had

worked out who it was - none other than Rex VK7MO, as he was heading north on his Microwave grid hopping adventure. The microwave dishes on top of his 4X4 were the giveaway. On my return leg in PF79, strong winds blew up and after a while one of the tent pegs holding a guy line was pulled out of the ground and the antenna system came crashing down, destroying it. Hence I did not activate PF88 and PF97. As these are relatively close to home QTH, I intend activating these at a later date. I will experiment with antenna systems for the next trip as I think the one taken on this trip had a too narrow azimuth beam-width and hence struggled with stations on the longer paths, particularly to VK4 from VK8.

The complete list of stations worked from the activated gridsquares on 2m Meteor Scatter included:-

VK1WJ	PF78
VK2DVZ	PF78
VK2XN	PF78, PG64
VK3AMZ	PF78
VK3BJM	PF78
VK3HY	PF78, 79, PG62, 64, 65, 70, 71
VK3II	PG64
VK3KH	PF79, PG64
VK4CRO	PF89
VK4JMC	PF78, 79, 89, PG64
VK4LHD	PF89
VK4UH	PF89
VK5GF	PG64
VK5PJ	PF78, 79, 89, PG63, 64, 65, 70, 71, 72

Another hurdle to overcome was arranging operating times, frequencies and transmission periods without access to the mobile phone network or internet (VK-Logger, email etc), as a lot of the grids activated did not have coverage. Some that did were more off than on. Hence a lot more stations could have been worked. Added to the fact that a lot of stations had work commitments and were not QRV during the times. I did get random text decodes from Peter VK5PJ saying "BEAM VK4" which I did but unfortunately nothing eventuated. All things to consider and lessons learnt for the next "outing". I am glad to have made some operators happy in providing VK8 to them. Now some may be applying for the "Worked all States VHF" Award.

I see the destruction of the antenna system and the early return a blessing in disguise. On arrival home, my wife said I should get my left leg checked out. It had been hurting for the last 3-4 days of the trip. A long story short, I ended up in Hospital with DVT and now slowly recovering. So once antennas and myself have been repaired, more grids maybe on the agenda.

As my work involves some travel, many other grids could become activated sometimes, unfortunately, with very little notice. We also travel to Darwin and Alice Springs, so VK8 may become QRV again."

The next Meteor Shower to prepare for will be the Orionids, another Class-one event, expected to peak on October 22nd – I inadvertently omitted this shower from my list last month.

Please send any reports, questions or enquiries about Meteor Scatter in general or the digital modes used to Kevin VK4UH